

S/N 10/683,817

Response to Office Action Mailed 04/14/2006

In the Claims

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2 1. (Currently Amended) An encoding system for determining position and
3 position changes of a moving member, comprising:

4 a sequence of encoder marks forming incremental patterns and at least one
5 index pattern, wherein two subsequent incremental patterns are indicative of an
6 incremental position-change of the moving member and the index pattern is
7 indicative of a reference position of the moving member;

8 a sensor configured to view a section of the encoder-mark sequence,
9 wherein the viewed section of the encoder-mark sequence carries redundant
10 incremental position-change information at least in regions not disturbed by the
11 index pattern; and

12 an analyzer arranged to analyze an encoder-mark pattern in the viewed
13 section with regard to the incremental patterns and the index pattern and to
14 generate, in response to a pattern match found, an incremental-position-change
15 signal and an index signal, wherein the signals are generated only after confirming
16 a correlation greater than selected thresholds between the encoder-mark pattern
17 and the incremental patterns and the index pattern.

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19 2. (Previously Presented) The encoding system of claim 1, wherein the
20 analyzer verifies a correlation between the viewed section and the index pattern to
21 be higher than a threshold as a condition of the index signal.
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1 3. (Previously Presented) The encoding system of claim 1, wherein the
2 length of the viewed section is larger than a length of the index pattern.

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4 4. (Previously Presented) The encoding system of claim 1, wherein
5 analyzer ascertains whether a correlation between the viewed section and the
6 encoder pattern is higher than a threshold as a condition of the incremental-
7 position-change signal.

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9 5. (Previously Presented) The encoding system of claim 1, wherein the
10 analyzer sets a detected pattern to a correct pattern closest to the detected pattern.

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12 6. (Previously Presented) The encoding system of claim 1, wherein a length
13 of the viewed section of the sequence of encoder marks is selected according to a
14 desired robustness-of the encoding system.

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1 7. (Currently Amended) An encoding system for determining position and
2 position changes of a moving member, comprising:

3 a row of encoder marks arranged along the moving member in a generally
4 regular manner to provide incremental position-change information;

5 at least one index marking in the form of a predefined pattern of encoder
6 marks which represents a disturbance of the regular encoder-mark arrangement;

7 a sensor arrangement viewing a section of the row of encoder marks and
8 arranged to provide a viewed pattern of the encoder-mark section;

9 an analyzer arranged to analyze the viewed pattern to generate incremental-
10 position-change signals in response to detection ~~on the basis of~~ the encoder marks
11 and an index signal in response to a detection of the ~~predefined index mark pattern~~
12 index marking, wherein the analyzer verifies a correlation between the viewed
13 section and the index mark pattern to be higher than a threshold as a condition of
14 the index signal, wherein the incremental-position-change signals and the index
15 signal are generated only after the analyzer has verified a correlation greater than
16 selected thresholds between the viewed pattern and the index marking or the
17 encoder marks.

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19 8. (Previously Presented) The encoding system of claim 7, wherein
20 robustness of the encoding system against noise is increased by viewing a longer
21 section of the row of encoder marks.

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1 9. (Previously Presented) The encoding system of claim 7, wherein
2 incremental-position-change signals are generated by use of the viewed section,
3 even when the viewed section is disturbed by the index mark pattern.
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5 10. (Original) The encoding system of claim 7, wherein the sensor
6 arrangement is arranged to detect, in the viewed section, a multiplicity of encoder
7 marks, so that the detected encoder marks carry redundant incremental position-
8 change information at least in regions of regular encoder-mark arrangement,
9 wherein the detection of the multiplicity of encoder marks enables the
10 incremental-position-change signals to be generated also in that section of the
11 encoder-mark row in which the regular encoder-mark arrangement is disturbed by
12 the index marking.
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14 11. (Previously Presented) The encoding system of claim 7, wherein the
15 incremental-position-change signals are generated only after confirming a
16 correlation between the viewed section and an encoder pattern that is greater than
17 a second threshold.
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19 12. (Previously Presented) The encoding system of claim 7, wherein the
20 analyzer sets a detected pattern to a correct pattern closest to the detected pattern.
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22 13. (Previously Presented) The encoding system of claim 7, wherein a
23 length of the viewed section is larger than a length of the index mark pattern.
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1 14. (Currently Amended) An encoding system for determining position and
2 position changes of a moving member, comprising:

3 a row of identical encoder marks forming incremental patterns and at least
4 one index pattern, wherein two subsequent incremental patterns are indicative of
5 an incremental position-change of the moving member and the index pattern is
6 indicative of a reference position of the moving member;

7 a sensor arrangement detecting a pattern of a section of the encoder-mark
8 row;

9 an analyzer arranged to analyze the ~~detected encoder mark pattern of the~~
10 section of the encoder-mark row detected by the sensor arrangement with regard to
11 the incremental patterns and the index pattern and to generate, in response to an
12 incremental-pattern match found, an incremental-position-change signal and, in
13 response to an index-pattern match found, an index signal, wherein ~~the analyzer~~
14 ~~verifies a correlation between the section viewed by the sensor arrangement and~~
15 ~~the index pattern to be higher than a threshold as a condition of the index~~
16 signal. the analyzer generates the signals only after verifying a correlation greater
17 than selected thresholds between the section of the encoder-mark row detected by
18 the sensor arrangement and the index pattern, and between the section of the
19 encoder-mark row detected by the sensor arrangement and the incremental pattern.
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21 15. (Previously Presented) The encoding system of claim 14, wherein the
22 analyzer sets a detected pattern to a correct pattern closest to the detected pattern.
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1 16. (Previously Presented) The encoding system of claim 14, wherein a
2 length of the section of the encoder mark sequence viewed by the sensor
3 arrangement is selected according to a desired robustness of the encoding system.

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5 17. (Original) The encoding system of claim 14, wherein the sensor
6 arrangement comprises a sensor element arranged to successively detect the
7 encoder marks or groups of the encoder marks in the section of the encoder-mark
8 row upon the movement of the moving member, wherein the encoding system is
9 arranged to combine the successively detected encoder marks to form the detected
10 encoder-mark pattern.

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12 18. (Original) The encoding system of claim 14, wherein subsequent
13 incremental patterns overlap.

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15 19. (Previously Presented) The encoding system of claim 14, wherein a
16 length of the section of the encoder-mark row viewed by the sensor arrangement is
17 sufficient to enable incremental-position-change information to be generated even
18 when the section is disturbed by the index pattern.

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1 20. (Previously Presented) A printing device having an encoding system for
2 determining position and position changes of a recording medium conveyor to
3 determine the position of a recording medium placed on the conveyor, comprising:

4 a sequence of encoder marks forming incremental patterns and at least one
5 index pattern, wherein two subsequent incremental patterns are indicative of an
6 incremental position-change of the conveyor and the index pattern is indicative of
7 a reference position of the conveyor;

8 a sensor arrangement viewing a section of the encoder-mark sequence, the
9 length of which is greater than one position-change increment;

10 an analyzer arranged to analyze an encoder-mark pattern in the viewed
11 section with regard to the incremental patterns and the index pattern and to
12 generate, in response to a pattern match found, an incremental-position-change
13 signal and an index signal, wherein the incremental-position-change signal and the
14 index signal are generated only after confirming a correlation greater than selected
15 thresholds between the viewed section and an incremental pattern or the index
16 pattern, respectively.

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18 21. (Original) The printing device of claim 20, wherein the recording
19 medium conveyor is a belt conveyor.

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21 22. (Original) The printing device of claim 20, wherein the encoder-mark
22 sequence is an encoder-mark row arranged along the recording medium conveyor.
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1 23. (Original) The printing device of claim 20, wherein the printing device
2 has a plurality of print stations arranged along the recording medium conveyor,
3 and each print station is individually equipped with said sensor arrangement and
4 analyzer.

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6 24. (Original) The printing device of claim 20, wherein the printing device
7 is a page-wide ink-jet printer.
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1 25. (Currently Amended) A printing device having an encoding system for
2 determining position and position changes of a recording medium conveyor to
3 determine the position of a recording medium placed on the conveyor, comprising:
4 a row of encoder marks arranged along the conveyor in a generally regular
5 manner to provide incremental position-change information;
6 at least one index marking in the form of a predefined pattern of encoder
7 marks which represents a disturbance of the regular encoder-mark arrangement;
8 a sensor arrangement viewing a section of the row of encoder marks and
9 arranged to provide a viewed pattern of the encoder-mark section;
10 an analyzer arranged to analyze the viewed pattern to generate incremental-
11 position-change signals on the basis of the encoder marks and an index signal in
12 response to a detection of the predefined index mark pattern, wherein the analyzer
13 is configured to extract redundant incremental position-change information from
14 the viewed section of the row of encoder marks at least in regions not disturbed by
15 the index pattern,
16 wherein the incremental-position-change signals are enabled to be
17 generated also in that section of the encoder-mark row in which the regular en-
18 coder-mark arrangement is disturbed by the index marking[.]; and
19 wherein the analyzer sets the viewed pattern to a correct pattern closest to
20 the viewed pattern.
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1 26. (Original) The printing device of claim 25, wherein the recording
2 medium conveyor is a belt conveyor.

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4 27. (Original) The printing device of claim 25, wherein the printing device
5 has a plurality of print stations arranged along the recording medium conveyor,
6 and each print station is individually equipped with said sensor arrangement and
7 analyzer.

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9 28. (Original) The printing device of claim 25, wherein the printing device
10 is a page-wide ink-jet printer.

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1 29. (Previously Presented) A printing device having an encoding system for
2 determining position and position changes of a recording medium conveyor to
3 determine the position of a recording medium placed on the conveyor, comprising:

4 a row of identical encoder marks forming incremental patterns and at least
5 one index pattern, wherein two subsequent incremental patterns are indicative of
6 an incremental position-change of the conveyor and the index pattern is indicative
7 of a reference position of the conveyor;

8 a sensor arrangement detecting a pattern of a section of the encoder-mark
9 row;

10 an analyzer arranged to analyze the detected encoder-mark pattern with
11 regard to the incremental patterns and the index pattern and to generate, in
12 response to an incremental-pattern match found, an incremental-position-change
13 signal and, in response to an index-pattern match found, an index signal, wherein
14 the incremental-position-change signal and the index signal are generated only
15 after confirming a correlation greater than selected thresholds between the
16 detected pattern and an incremental pattern or the index pattern, respectively.

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18 30. (Original) The printing device of claim 29, wherein the recording
19 medium conveyor is a belt conveyor.

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21 31. (Original) The printing device of claim 30, wherein the encoder-mark
22 row is arranged along the recording medium conveyor.
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1 32. (Original) The printing device of claim 30, wherein the printing device
2 has a plurality of print stations arranged along the recording medium conveyor,
3 and each print station is individually equipped with said sensor arrangement and
4 analyzer.

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6 33. (Original) The printing device of claim 30, wherein the printing device
7 is a page-wide ink-jet printer.

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9 34. (Currently Amended) A method of determining position and position
10 changes of a moving member using a sequence of encoder marks which forms
11 incremental patterns and at least one index pattern, wherein two subsequent
12 incremental patterns are indicative of an incremental position-change of the
13 moving member and the index pattern is indicative of a reference position of the
14 moving member, comprising the steps:

15 viewing a section of the encoder-mark sequence, wherein the viewed
16 section carries redundant incremental position-change information at least in
17 regions not disturbed by the index pattern and the length of the section is greater
18 than one position-change increment;

19 analyzing a encoder-mark pattern in the viewed section with regard to the
20 incremental patterns and the index pattern, wherein in response to an incorrect
21 detected pattern in the viewed section, the incorrect detected pattern is set to a
22 correct pattern closest to the incorrect detected pattern; and

23 generating, in response to a pattern match found, an incremental-position-
24 change signal and an index signal.
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1 35. (Currently Amended) A method of determining position and position
2 changes of a moving member using a row of encoder marks arranged along the
3 moving member in a generally regular manner to provide incremental position-
4 change information; at least one index marking in the form of a predefined pattern
5 of encoder marks which represents a disturbance of the regular encoder-mark
6 arrangement, comprising the steps:

7 viewing a section of the row of encoder marks, wherein the section viewed
8 has a length selected according to a desired robustness of the encoding system;

9 providing a viewed pattern of the encoder-mark section, wherein the
10 viewed pattern of the encoder-mark section carries redundant incremental
11 position-change information at least in regions not disturbed by the index pattern;

12 analyzing the viewed pattern to generate incremental-position-change
13 signals providing the incremental position-change information on the basis of the
14 encoder marks and an index signal in response to a detection of the pre-defined
15 index mark pattern, wherein in response to an incorrect detected pattern in the
16 viewed section, the incorrect detected pattern is set to a correct pattern closest to
17 the incorrect detected pattern;

18 wherein the incremental-position-change signals are enabled to be
19 generated also in that section of the encoder-mark row in which the regular
20 encoder-mark arrangement is disturbed by the index marking.